

Application No. 10/643,043
Docket No. DP-308286
Amendment dated March 9, 2005
Reply to Office Action of December 9, 2004

REMARKS

In the Office Action, the Examiner reviewed claims 1-20 of the above-identified US Patent Application¹, with the result that the specification and drawings were objected to, claims 6 and 13-20 were rejected under 35 USC §112, second paragraph, and all of the claims were rejected under 35 USC §102 or §103. In response, Applicants have amended the specification and claims as set forth above. More particularly:

The title of the invention has been amended at page 1 of the specification so as to be more descriptive of the invention recited in the elected claims, and the specification has been amended at paragraph [0003] to update the status of the U.S. patent application originally identified as Attorney Docket No. DP-308094, which issued as U.S. Patent No. 6,700,195 after the filing of the present application.

In amended Figure 2, the leadline for reference number 30 near the middle of the assembly 110 has been corrected.

In the claims, independent claim 1 has been amended to more particularly correspond to the embodiment of Figure 1, and independent claim 13 has been amended to more particularly correspond to the embodiment of Figure 2.

¹ Applicants previously canceled claims unelected claims 21-40.

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Independent claims 1 and 13 have been further amended to require that the solder joint (30) consists essentially of an indium preform into which one or more alloying constituents have diffused to increase the melting temperature of the solder joint (30) above that of the indium preform. Support for this amendment can be found in Applicants' specification at paragraph [0016].

Independent claim 1 has also been amended to require that the overmold compound (32) encapsulates the substrate (14), device (12), and solder joint (30) on the housing member (20), and that the overmold compound (32) has a cure temperature approximately equal to the melting temperature of indium but less than the melting temperature of the solder joint (30) so as to enable curing of the overmold compound (32) without adversely affecting the bond formed by the solder joint (30) between the device (12) and the heat-conductive member (26). Support for this amendment can be found in Applicants' specification at the last sentence of paragraph [0008] and the last sentence of paragraph [0017].

Dependent claim 6 and independent claim 13 have been amended to clarify that the "solder joint" is solid, as opposed to a liquid. Support for these amendments can be found in Applicants' specification at paragraph [0016] ("the mixture of indium and the alloying constituents . . . solidify and form the solder

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joint 30").

Dependent claim 7 and independent claim 13 have been amended to require a structural adhesive (24) bonding the substrate (14) to the housing (14), and that the structural adhesive (24) has a cure temperature approximately equal to indium but less than the melting temperature of the solder joint (30) so as to enable simultaneous curing of the structural adhesive (24) and diffusion of the one or more alloying constituents into the indium preform. Support for this amendment can be found in Applicants' specification at paragraph [0012] ("Edges of the substrate 14 are shown bonded to raised features 23 of the backplate 20 with a structural adhesive 24") and the last sentence of paragraph [0018] ("the reflow temperature of the solder joint 30 is compatible with curing cycles for adhesives of the type suitable for use as the structural adhesive 24 that adhesively bonds the substrate 14 to the backplate 14, such that these operations can be performed simultaneously").

Dependent claims 2, 8, 9, and 17 have been canceled without prejudice to Applicants.

Applicants believe that the above amendments do not present new matter. Favorable reconsideration and allowance of remaining claims 1, 3-7, 10-16, and 18-20 are respectfully requested in view of the above amendments and the following remarks.

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Rejection under 35 USC §112, Second Paragraph

Remaining claims 6, 13-16, and 18-20 were rejected under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter that Applicants regard as their invention. The §112 rejection was on the basis of the Examiner's concern as to whether the claimed solder joint can be "considered 'a thermally-conductive lubricant' when solder is in the liquid or melted state." In response, Applicants have amended claims 6 and 13 (from which claims 14-16 and 18-20 depend) to expressly state that the solder joint is a "solid," consistent with Applicants' specification as noted above. Applicants therefore respectfully request withdrawal of the rejection under 35 USC §112.

Rejections under 35 USC §102

Independent claim 1, its remaining dependent claims 6, 7, and 10-12, independent claim 13, and its remaining dependent claims 18-20 were rejected under 35 USC §102 as being anticipated by U.S. Patent No. 5,325,265 to Turlik et al. (Turlik), U.S. Patent No. 6,423,570 to Ma et al. (Ma), U.S. Patent No. 4,081,825 to Koopman et al. (Koopman), and/or U.S. Patent No. 5,396,403 to Patel. Applicants respectfully request reconsideration of these rejections in view of the amendments presented above as well as the following

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comments.

As noted in §2131 of the MPEP:

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. The identical invention must be shown in as complete detail as is contained in the ...claim. The elements must be arranged as required by the claim, but this is not an ipsissimis verbis test, i.e. identity of terminology is not required. (Citations omitted).

Applicants' amended independent claim 1 recites an electronic assembly (10) that requires:

a housing member (20) comprising a heat-conductive member (20,26);

a substrate (14) supported by the housing member (20);

a circuit device (12) mounted to the substrate (14);

a solid solder joint (30) bonding the device (12) to the heat-conductive member (20,26) and consisting essentially of an indium preform into which one or more alloying constituents have diffused to increase the melting temperature of the solder joint (30) above that of the indium preform; and

an overmold compound (32) that encapsulates the substrate (14), the device (12), and the solder joint (30), and has a cure

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temperature approximately equal to the melting temperature of indium but less than the melting temperature of the solder joint (30) so as to enable curing of the overmold compound (32) without adversely affecting the bond formed by the solder joint (30) between the device (12) and the heat-conductive member (20,26).

In contrast, none of the §102 references are believed to disclose Applicants' solder joint (30) formed by an indium preform into which alloying constituents have been diffused increase the melting temperature of the solder joint (30) above that of the indium preform, and an overmold compound (32) that encapsulates the solder joint (30) but is process-compatible with the solder joint (30) as a result of having a cure temperature approximately equal to the melting temperature of indium but less than the melting temperature of the solder joint (30).

Applicants' amended independent claim 13 recites an electronic assembly (110) that requires:

- a housing (20) comprising a pedestal (26);
- a substrate (14) supported by the housing (20);
- a circuit device (12) mounted to the substrate (14);

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a solid solder joint (30) bonding the device (12) to the heat-conductive member (20,26) and consisting essentially of an indium preform into which one or more alloying constituents have diffused to increase the melting temperature of the solder joint (30) above that of the indium preform; and

a structural adhesive (24) bonding the substrate (14) to the housing (20) and having a cure temperature approximately equal to indium but less than the melting temperature of the solder joint (30) so as to enable simultaneous curing of the structural adhesive (24) and diffusion of the at least one alloy constituent into the indium preform.

In contrast, none of the §102 references are believed to disclose Applicants' solder joint (30) formed by indium preform into which alloying constituents have been diffused to increase the melting temperature of the solder joint (30) above that of the indium preform, and a structural adhesive (24) that bonds the substrate (14) to the housing (20) and is process-compatible with the solder joint (30) as a result of having a cure temperature approximately equal to the melting temperature of indium but less than the melting temperature of the solder joint (30).

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In view of the above, Applicants respectfully request withdrawal of the rejections under 35 USC §102.

Rejections under 35 USC §103

Claims 3-5 and 7 (which depend from independent claim 1), independent claim 13, and its remaining dependent 14-16 and 18-20 were rejected under 35 USC §103 as being unpatentable over Turlik, Ma, Koopman, Patel, and/or U.S. Patent No. 6,180,436 to Koors et al. (Koors) in view of Patel, U.S. Patent Application Publication No. 2004/0188503 to Hua, U.S. Patent No. 6,504,242 to Deppisch et al. (Deppisch), or U.S. Patent No. 6,238,938 to Smith. Applicants respectfully request reconsideration of these rejections in view of the amendments presented above as well as the following comments.

As with Turlik, Ma, Koopman, and Patel, Applicants believe that Koors, Hua, Deppisch, and Smith do not disclose Applicants' solder joint (30) formed by indium preform into which alloying constituents have been diffused so that the melting temperature of the solder joint (30) is higher than that of the indium preform, or Applicants' overmold compound (32) that encapsulates the solder joint (30) but is process-compatible with the solder joint (30) as a result of having a cure temperature approximately equal to the melting temperature of indium but less than the melting temperature of the solder joint (30)

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(independent claim 1), or Applicants' structural adhesive (24) that bonds the substrate (14) to the housing (20) and is process-compatible with the solder joint (30) as a result of having a cure temperature approximately equal to the melting temperature of indium but less than the melting temperature of the solder joint (30). Applicants therefore respectfully request withdrawal of the rejections under 35 USC §103.

Closing

In view of the above, Applicants believe that all issues outstanding from the Office Action have been addressed, and respectfully request that their patent application be given favorable reconsideration.

Should the Examiner have any questions with respect to any matter now of record, Applicants' representative may be reached at (219) 462-4999.

Respectfully submitted,

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Attachment: Replacement Drawing Sheet